T.E.R.I.

Total Energy Resources, Inc.

"ENGINEERED SOLUTIONS"

Indirect Fired Water Bath Heaters

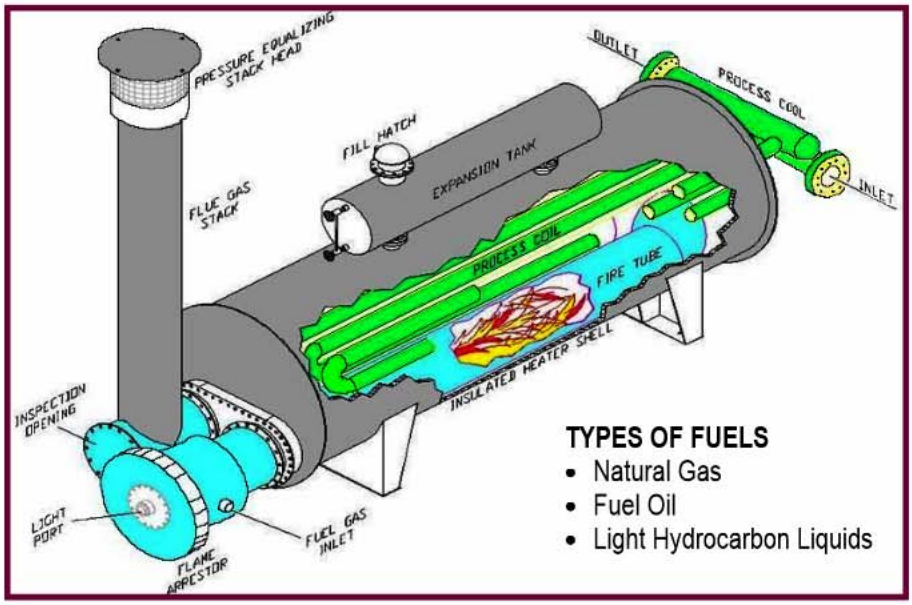
OVERVIEW

Indirect fired water bath heaters are used successfully in hundreds of utility, processing, and upstream oil and gas industry applications.

Water bath heaters are commonly used in applications where process temperatures do not exceed 170°F.

Typical uses include:

- Heating natural gas prior to pressure reduction to eliminate frost formation downstream of expansion valving.
- Preventing hydrate formation in well stream fluids.
- Heating well stream fluids prior to phase separation.
- Heating process streams to maintain fluid viscosity at a minimum to reduce HP pumping requirements.
- Heating critical feed stocks that require tightly controlled film to bulk temperature differentials.
- Heating turbine fuel gases to maintain a given dew point temperature.



TYPES OF FUELS

- Natural Gas
- Fuel Oil
- Light Hydrocarbon Liquids

HEATER OPERATION

The process to be heated flows through a serpentine configured coil that is mounted in the upper reaches of the heater shell. A controlled amount of heat is liberated into the firetube (combustion chamber) which is located in the lower reaches of the heater shell where heat is efficiently transferred form the firetube in the bath media. The heat contained in the bath media is then transferred by natural convection into the process stream which flows through the process coil.

HEATER COMPONENTS

The indirect fired water bath heater consists of the following components each designed to meet specific design criteria:

The heater shell is an atmospheric vessel designed in accordance with API 12 K requirements. The shell contains the process coil, firetube (combustion chamber), and heat media.

The firetube is commonly of the U-tube configuration. The tube is removable & designed to efficiently transfer heat into the surrounding heat media and to minimize flue gas friction losses.

The process coil is a pressure containing part commonly designed in accordance with API—12K or ASME Section VIII Division 1 code requirements.

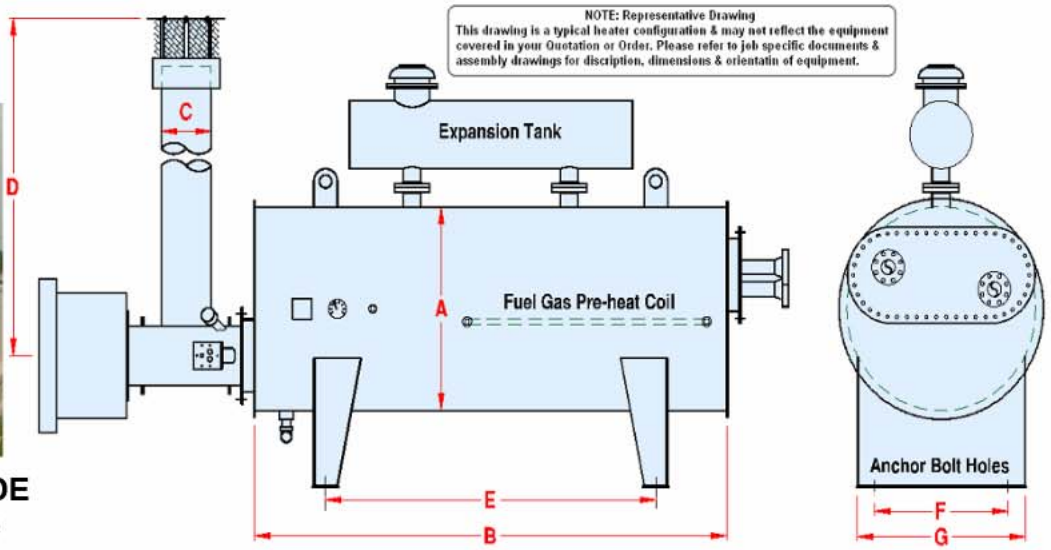
The flue gas stack is designed to provide positive flue gas flow (draft) by overcoming the friction losses in the complete combustion system.

The heat media is commonly a mixture of inhibited ethylene or propylene glycol and water which is blended to a consistency to provide the proper freeze protection for a given application.

The expansion tank is designed to reduce internal corrosion within the heater shell by keeping the heater shell liquid packed & moving the wet dry interface of the expanding bath media from the heater shell into the expansion tank. The expansion tank is designed to contain 100% of the expanded bath media from a temperature of 40° to the maximum operating temperature.

Accessories Items: TERI designs & manufactures heaters with a wide variety of accessories to meet customer specified mechanical & operation requirements. Including simple pneumatic controls to sophisticated remotely controlled & monitored equipment.

"ENGINEERED SOLUTIONS"



STANDARD FEATURES INCLUDE

- Laser cut shop fabricated components
- Individually removable firetubes
- 304 SS Flue gas stack or stacks
- Stack clean out tee
- Flue gas stack anti reverse-draft diverters w/rain cap & bird screens
- "Pilot In A Drawer" assemblies for easy maintenance & inspection
- Basic electric & pneumatic in addition to PLC control systems
- Multi mitered firetube bends (no single miter cut to greater than 22.5°)
- Positive seal flange designs
- Bath media expansion reservoir designed to hold 6% of the total bath media
- Heat media level gauge
- Heat media temperature Indicator
- Shell designed in accordance with API 12K
- Coil designed and stamped in accordance with ASME-8-1
- 100% Radiography on process coil welds
- Process coil, National Board Stamped

MM Btu/Hr	A	B	C	D	E	F	G
0.10	20"	6'	6.63"	10'0"	5'8"	1'2"	1'7"
0.25	24"	7'5"	8.63"	10'0"	7'2"	1'2"	1'7"
0.50	30"	10'0"	10.75"	12'0"	7'0"	1'8"	2'3"
0.75	36"	12'0"	10.75"	12'0"	9'0"	2'0"	2'8"
1.00	42"	15'0"	12.75"	14'0"	10'0"	2'2"	3'1"
1.25	42"	15'0"	12.75"	14'0"	10'0"	2'2"	3'1"
1.50	48"	17'5"	14"	15'0"	12'6"	2'10"	3'7"
1.75	48"	20'0"	16"	15'0"	16'0"	2'10"	3'7"
2.00	54"	20'0"	18"	15'0"	15'0"	3'0"	3'11"
2.50	54"	22'5"	18"	16'0"	17'6"	3'0"	3'11"
3.00	60"	22'5"	20"	16'0"	18'6"	3'0"	4'4"
3.50	72"	27'7"	22"	17'5"	22'6"	4'0"	5'3"
4.00	72"	30'0"	24"	17'5"	25'0"	4'0"	5'3"
4.50	84"	32'0"	24"	17'5"	27'0"	4'6"	6'2"
5.00	84"	32'0"	26"	17'5"	27'0"	4'6"	6'2"
6.00	84"	32'0"	28"	17'5"	27'0"	4'6"	6'2"
7.00	96"	30'0"	2@22"	17'5"	25'0"	5'6"	6'11"
8.00	96"	32'0"	2@22"	17'5"	27'0"	5'6"	6'11"
10.00	102"	32'0"	2@26"	20'0"	27'0"	6'0"	7'6"

(OTHER SIZES ARE AVAILABLE . . . "ENGINEERED SOLUTIONS")

Optional Control Enhanced Designs

- Pneumatic controlled equipment operation
- Electrical controlled equipment operation
- Combination pneumatic & electrical controlled equipment operation
- Flame-Safeguard assemblies including, Pneumatic, 120VAC & 12VDC or Solar Power
- Manual OR Automatic pilot ignition designs

Optional Fabricated Enhanced Components

- Cushioned (Electrically Insulated) process coil supports & Tube Sheets
- Shell internally grit or sandblasting w/water soluble rust preventive coating
- Customized heater supports to meet existing pier locations
- Hot dipped galvanized heater skids, ladders & platforms

	Units	Ethylene	Propylene
Freezing Point	**Temp (°F)**	**-32**	**-24**
Boiling Point (1 Atm)	**Temp (°F)**	**225**	**222**
Specific Gravity	**60 / 60**	**1.064**	**1.043**
Viscosity @ 200°F	**Centipoises**	**0.75**	**0.75**
Specific Heat @ 200°F	**Btu / Lb / °F**	**0.83**	**0.91**
Thermal Conductivity	**Btu / Hr, Sq Ft, °F / Ft**	**0.28**	**0.022**

*Properties are representative of 50% Glycol / 50% Water

Heater Type	Process Temp (F)
Water/Glycol	160°
LP Steam (<15 Psig)	220°
Heat Transfer Oil	400°
Eutectic Salt	600°
Flue Gas Recirculation	625°

www.terisales.com
8939 West 21st St., Sand Springs, OK 74063
(918) 447-0844 • Fax (918) 447-0877